



Billing Code 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[Docket No. 150106016-5016-01]

RIN 0648-XD703

Endangered and Threatened Wildlife and Plants; Notice of 12-Month Finding on a Petition to List Bottlenose Dolphins in Fiordland, New Zealand as Threatened or Endangered under the Endangered Species Act

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, NMFS, announce a 12-month finding on a petition to list bottlenose dolphins (*Tursiops truncatus*) within Fiordland, New Zealand as threatened or endangered under the Endangered Species Act (ESA). Based on our review of the best scientific and commercial data available, we have determined that the bottlenose dolphins within Fiordland do not meet the criteria for identification as a distinct population segment. Therefore, these dolphins do not warrant listing, and we do not propose to list these dolphins under the ESA.

DATES: This finding was made on *[insert date of publication in the FEDERAL REGISTER]*.

ADDRESSES: Information used to make this finding is available for public inspection by appointment during normal business hours at NMFS, Office of Protected Resources, 1315 East

West Highway, Silver Spring, MD 20910. The petition and the list of the references used in making this finding are also available on the NMFS website at

<http://www.nmfs.noaa.gov/pr/species/petition81.htm>.

FOR FURTHER INFORMATION CONTACT: Lisa Manning, NMFS, Office of Protected Resources (OPR), (301) 427-8403.

SUPPLEMENTARY INFORMATION:

Background

On July 15, 2013, we received a petition from WildEarth Guardians to list 81 marine species as threatened or endangered under the Endangered Species Act (ESA). We found that the petitioned actions may be warranted for 27 of the 81 species and announced the initiation of status reviews for each of the 27 species (78 FR 63941, October 25, 2013; 78 FR 66675, November 6, 2013; 78 FR 69376, November 19, 2013; 79 FR 9880, February 21, 2014; and 79 FR 10104, February 24, 2014). Among the 27 species that we determined may warrant listing under the ESA is the bottlenose dolphin, *Tursiops truncatus*, of Fiordland, New Zealand. This finding addresses those bottlenose dolphins.

We are responsible for determining whether species are threatened or endangered under the ESA (16 U.S.C. 1531 *et seq.*). To make this determination, we consider first whether a group of organisms constitutes a “species” under the ESA, then whether the status of the species qualifies it for listing as either threatened or endangered. Section 3 of the ESA defines a “species” to include “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” On February 7, 1996, NMFS and the U.S. Fish and Wildlife Service (USFWS; together, the

Services) adopted a policy describing what constitutes a distinct population segment (DPS) of a taxonomic species (the DPS Policy, 61 FR 4722). The DPS Policy identifies two elements that must be considered when identifying a DPS: (1) the discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs. As stated in the DPS Policy, Congress expressed its expectation that the Services would exercise authority with regard to DPSs sparingly and only when the biological evidence indicates such action is warranted.

Section 3 of the ESA defines an endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range” and a threatened species as one “which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” We interpret an “endangered species” to be one that is presently in danger of extinction. A “threatened species,” on the other hand, is not presently in danger of extinction, but is likely to become so in the foreseeable future (that is, at a later time). In other words, the primary statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either presently (endangered) or in the foreseeable future (threatened).

Section 4(a)(1) of the ESA requires us to determine whether any species is endangered or threatened due to any one or a combination of the following five threat factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its

continued existence. We are also required to make listing determinations based solely on the best scientific and commercial data available, after conducting a review of the species' status and after taking into account efforts being made by any state or foreign nation to protect the species.

Species Description

Taxonomy and Physical Characteristics

The common bottlenose dolphin, *Tursiops truncatus*, is one of the most well-known and well-studied species of marine mammals. The bottlenose dolphin is a cetacean within suborder Odontoceti (toothed whales) and family Delphinidae. Up to 20 separate species have been proposed at various times as a consequence of bottlenose dolphins' geographically diverse and highly plastic physical characteristics. Although uncertainty and debate remain regarding their taxonomic status, two species of *Tursiops* are now generally recognized - the common bottlenose, *Tursiops truncatus*, and the Indo-Pacific bottlenose, *T. aduncus* (Connor *et al.* 2000). A third species, *T. australis*, which occurs along the southern coast of Australia, has been recently proposed (Viaud-Martinez *et al.* 2008) but is not yet formally accepted. The bottlenose dolphins in Fiordland, New Zealand have been placed in *T. truncatus* based on their longer length; smaller beaks, flippers, and dorsal fins; and lack of ventral spotting, which is common in *T. aduncus* and very rarely seen on *T. truncatus* (Wang *et al.*, 2000; Boisseau, 2003). This classification has since been supported by genetic data (Tezanos-Pinto *et al.* 2008).

In general, the bottlenose dolphin body form is described as being robust with a short, thick beak. Their coloration ranges from light gray to black with lighter coloration on the belly. Coastal animals are typically smaller and lighter in color, while pelagic animals tend to be larger, and darker in coloration. Dolphins living in warm, shallow waters also tend to have smaller body

sizes and proportionately larger flippers than animals living in cool, deep waters (Hersh and Duffield 1990; Chong and Schneider 2001).

Bottlenose adults range in length from about 1.8 to 3.9 m, with some even larger sizes reported for some populations from the southern hemisphere (Leatherwood *et al.*, 1983). Based on measurements of two carcasses and stereophotogrammetry (a technique for obtaining measurements from photographs) of live dolphins from one fiord (Doubtful Sound), the bottlenose dolphins in Fiordland appear to be morphologically similar to pelagic animals and those in temperate coastal regions, but larger and more robust in body form than bottlenose dolphins in lower latitudes (Chong and Schneider 2001; Boisseau 2003). The two carcasses measured were of an adult, 7-year old male that was 3.2 m long and a sub-adult 3-year old female that was 2.8 m long (Boisseau, 2003). Asymptotic total length in adult bottlenose dolphins in Doubtful Sound is predicted to reach at least 3.2 m (Chong and Schneider 2001). Sexual dimorphism of Fiordland bottlenose dolphins may also occur, with males potentially reaching larger sizes than females (Boisseau, 2003). Based on laser photogrammetry (also known as laser-metrics) on 20 adult females and 14 adult males, Rowe and Dawson (2008) found that adult males in Doubtful Sound have significantly taller and wider dorsal fins than adult females; however, the differences were not such that adults could be sexed in the wild on the basis of their dorsal fins.

Range and Distribution

Bottlenose dolphins are found in tropical and temperate waters around the world from roughly 45°N to 45°S (Leatherwood and Reeves, 1983) but are also known to occur in latitudes greater than 45° in multiple locations within both hemispheres (e.g., United Kingdom, northern

Europe, South Africa, New Zealand, and Tierra del Fuego; Ross 1979; Jefferson *et al.* 2008; Olavarria *et al.* 2010; Goodall *et al.* 2011). The species includes coastal populations that migrate into bays, estuaries, and river mouths, as well as offshore populations that inhabit pelagic waters along the continental shelf. Movement patterns of bottlenose populations vary, with some exhibiting long-term residency, seasonal migrations, or even fully pelagic lifestyles. Individual ranges can be influenced by water temperature and associated prey distributions (Hansen 1990; Wells *et al.*, 1990), and use of separate areas to hunt for various preferred prey is not uncommon (Defran *et al.*, 1999; Sotkin *et al.*, 2006). Other factors that may affect habitat use include predation pressure (Mann *et al.* 2000; Heithaus and Dill 2002) and anthropogenic disturbance (Lusseau 2005b; Bejder *et al.* 2006).

Bottlenose dolphins have a discontinuous distribution within the coastal waters of both the North and South Islands of New Zealand. The three main coastal regions where they commonly occur are along the northeastern coast of the North Island, Marlborough Sounds, and Fiordland (Figure 1).

Bottlenose dolphins have been reported in many of the fiords within Fiordland, and sightings along the west coast down to Stewart Island off the southern coast of the South Island are fairly common (Boisseau 2003). Scientific surveys within Fiordland were first initiated in 1990 (Boisseau 2003), but have focused on only a few of the 14 fiords where bottlenose dolphins are known to occur. The Doubtful-Thompson Sound complex (hereafter Doubtful Sound) - the second largest and best studied of the fiords - hosts a small, resident population of bottlenose dolphins. Bottlenose dolphins also occur in the Dusky- Breaksea Sound complex (hereafter Dusky Sound) and Milford Sound; however, surveys of these fiords are more limited. Anecdotal

reports have been made of large groups of bottlenose dolphins in Dagg Sound and Preservation Inlet, which lie to the north and south of Dusky Sound, respectively (Figure 1; Boisseau 2003); and, between 1996 and 2009, there were five reports of groups of 5 to over 100 individuals (Currey 2008b) in Chalky and Preservation Inlets (Figure 1). Based on very limited photo-identification data, these dolphins were presumed to be visitors from one or more other populations and not Fiordland residents (Currey 2008b). We are not aware of any dedicated survey efforts in these fiords where dolphins have been occasionally reported. For those fiords that have been surveyed, more detailed information on the range and distribution of the dolphins is summarized below.

The bottlenose dolphins in Doubtful Sound have been described as being highly resident: almost all adults are observed during each survey (Henderson *et al.* 2013), and re-sighting probabilities are extremely high (mean = 0.9961, 95% CI: 0.9844–0.9991; Currey *et al.* 2009b). However, the range of these dolphins is not fully understood and may be changing. A review of historical sightings data indicates that during 1994-2003, there were only three instances of five or more dolphins leaving the fiord for more than 3 consecutive days (Henderson *et al.* 2013). Boisseau (2003) also reported that on rare occasions, single dolphins and mother-calf pairs from this fiord made offshore forays and were absent from the fiord for weeks to months. In 2009, a group of 15 dolphins that were photo-identified residents of Doubtful Sound were photographed in Dagg Sound (Henderson *et al.* 2013). Since then, the number of documented occurrences of dolphins leaving the fiord has increased in frequency (Henderson *et al.* 2013). Between November 2009 and October 2011 (with 22-35 total survey days per year), there have been six documented occasions of groups of 6 to 47 dolphins leaving the fiord for a minimum of 3 to 7

days. It is unlikely that dolphins were simply missed during the surveys, because this population is small (61, CV = 1.46%), the individuals were photo-identified using strict protocols, and survey effort was relatively high (Henderson 2013a; Henderson *et al.* 2013). These missing groups included roughly equal numbers of males and females and included adults, sub-adults, and calves (Henderson *et al.* 2013). Every individual in this population was absent on at least one of these six occasions and on an average of 3.55 of these occasions (SE = 0.28); but all were observed during later surveys (so had not died or permanently emigrated; Henderson *et al.* 2013). Causes of this apparent change in residency have not yet been determined. Destination of the dolphins once they leave is also unknown; however, on two occasions in 2011, Henderson *et al.* (2013) observed large groups moving out of Thompson Sound and heading north, and there are reports of Doubtful Sound dolphins to the south in Dagg Sound and Dusky Sound (Currey *et al.*, 2008b, citing L. Shaw, pers. comm.; Tezanos-Pinto *et al.* 2010, citing G. Funnell, pers. comm.).

Surveys of Dusky Sound are more limited. Currey *et al.* (2008c) obtained an asymptotic discovery curve and a high re-sighting rate of bottlenose dolphins in this fiord complex during summer 2007/2008, and thus concluded the dolphins were resident at least over the limited study period. Following the same survey methods as Currey *et al.*, (2008c), Henderson (2013a) conducted surveys from February 2009 to February 2012 in Dusky Sound (about 34 survey days per year), and after the first survey in 2009, did not identify any “new” dolphins (other than calves), which is further indication of population residency. During all of the surveys spanning 2007-2012, groups of 2-5 dolphins were missing on four occasions (Henderson 2013a). These “missing” dolphins were typically older males, and because they were always present in later surveys, permanent emigration was ruled out. Dusky Sound is relatively large, so it is possible

the surveys failed to capture these particular dolphins. There are only two documented cases where dolphins identified as part of the Doubtful Sound population have been observed in Dusky Sound (Currey *et al.*, 2008b, citing pers. comm. (Lance Shaw)): in 2003, two older males from Doubtful Sound were observed in the presence of other bottlenose dolphins, and one of the two (“Quasimodo”) was observed in Dusky Sound again in 2005.

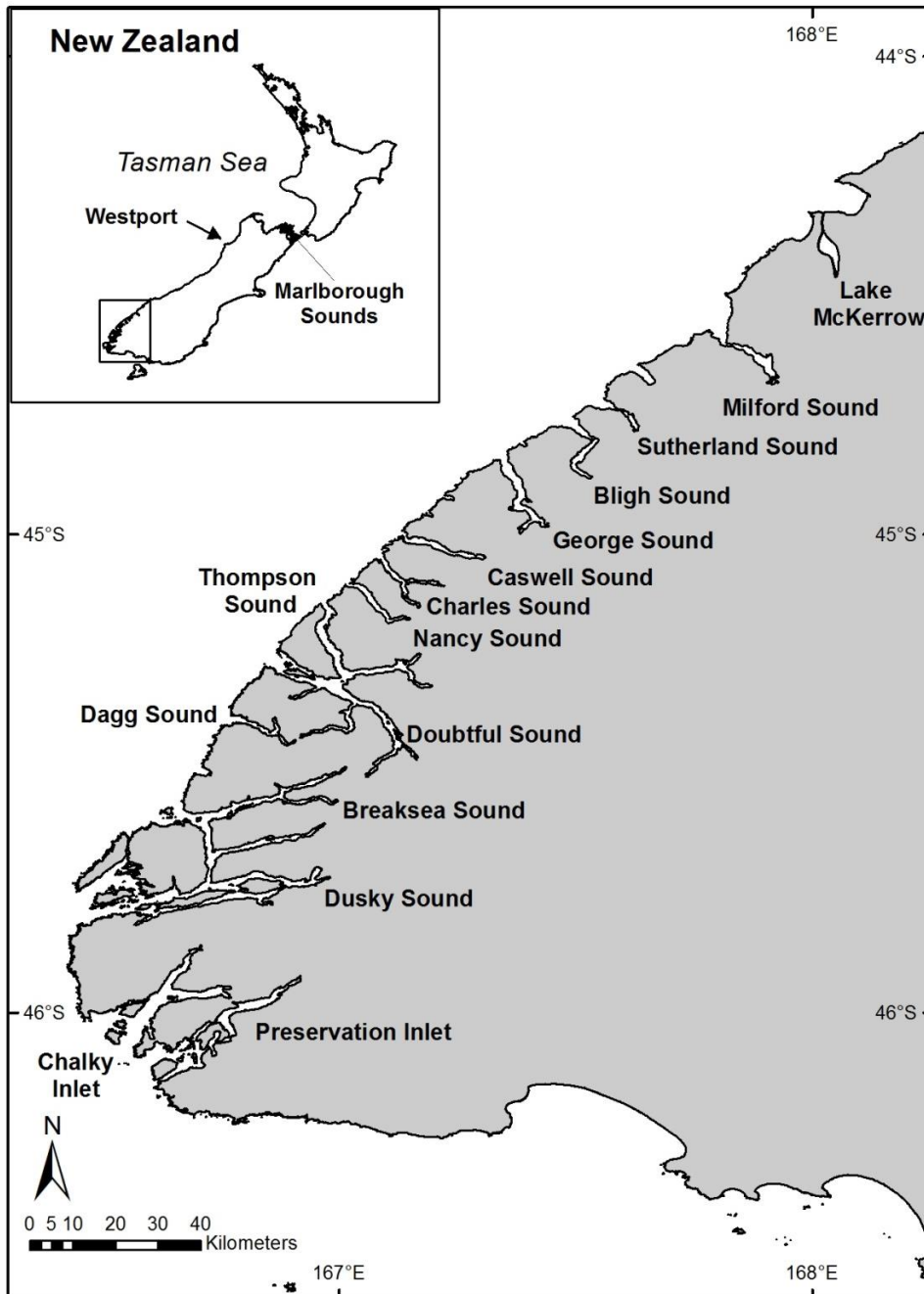
Within northern Fiordland, bottlenose dolphins have been most studied within Milford Sound, where dolphins are present throughout the year and where there is a significant amount of boat traffic and tourism. The bottlenose dolphins of Milford Sound are part of a more transient population that ranges across at least 6 fiords, several bays, and a lake system from Lake McKerrow south to Charles Sound (Figure 1; (Lusseau 2005a). Some photo-identified individuals have even been reported just north of Fiordland in Jackson Bay, which lies about 60 km north of Lake McKerrow (Russell *et al.*, 2004; as cited in Tezanos-Pinto *et al.*, 2010). Given that Milford Sound is relatively small (15.7 km long, 1.6 km wide on average; Stanton & Pickard, 1981), it is probably not adequate to support a resident population (Lusseau and Slooten 2002). Published surveys of the remainder of the known range of these dolphins appear to be lacking.

Seasonal and spatial distribution patterns of bottlenose dolphins appear to vary among fiords. In Doubtful Sound, the dolphins show a preference for the inner fiords during summer and the outer fiord during winter and spring (Elliott *et al.* 2011; Henderson 2013b). This pattern was positively correlated with surface water temperature, and dolphins were rarely sighted in water below 8° C (Henderson 2013b). It is possible that the dolphins prefer warmer water or that they are following seasonal changes in prey distributions. However, it is likely that thermal

stress on calves, which are born in the summer and autumn, explains the dolphins' avoidance of the inner fiords during winter months ((Elliott *et al.* 2011). In all seasons, the dolphins remained close to the fiord walls (Henderson 2013b). In contrast, during their early and late summer surveys of Dusky Sound, Currey *et al.* (2008c) found that the dolphins occurred throughout the entire fiord system. In a separate study, the dolphin distribution within Dusky Sound was positively correlated with surface water temperature during winter only, and in no season were the dolphins found in close association with the fiord walls as in Doubtful Sound (Henderson 2013b). Currey *et al.* (2008c) hypothesize that the differences in seasonal distributions for the Doubtful and Dusky sounds, which are only 46 km apart at their entrances, are due to oceanographic conditions specific to each fiord.

Distribution patterns of bottlenose dolphins within the northern fiords are not yet well understood and have only been evaluated in Milford Sound. Gaskin (1972, as cited in Lusseau, 2005) indicated that during ship surveys from 1968-1970, bottlenose dolphins were commonly observed in Milford Sound in summer but rarely during winter. Sighting network data for 1996-1999 also suggest that bottlenose dolphins are less common in this fiord during colder months (Lusseau and Sloaten 2002). However, a more recent study, in which Lusseau (2005b) surveyed Milford Sound with equal effort across four seasons, indicated that the dolphins occur in the sound more frequently in winter (December – February). Lusseau (2005b) proposed this change in habitat usage may be the result of increased boat traffic in Milford Sound during the summer season.

Figure 1. Fiordland, New Zealand and the location of the specific fiords.



Habitat

Fiordland is a mountainous region extending along more than 200 km of the southwest coast of the South Island (Figure 1). It includes 14 major fiords and their associated arms. The 14 fiords range in length from 15 km to 38 km (Gibbs *et al.* 2000) and can reach depths greater than 400 m (Heath 1985). Carved by Pleistocene glaciers (26,000-18,000 years ago), the 14 major valleys in Fiordland were once freshwater lakes; then, about 12,000 – 6,000 years ago, sea level rose above the terminal moraine or sill at the mouths of the valleys, inundating them with seawater (Wing and Jack 2014). The underwater sills (30-145 m deep) still partially separate the fiords from the Tasman Sea (Heath 1985). The region receives a tremendous amount of orographic precipitation (i.e., relief-associated rainfall) – up to 6-8 m per year (Gibbs *et al.* 2000). The large volume of freshwater input along with the deep bathymetry, narrow tidal range, and somewhat limited ocean swell within the inner fiords, contribute to a persistent and precipitous salinity stratification within the fiords (Wing and Jack 2014). Greater wave action and mixing, however, occurs near the fiord entrances (Wing and Jack 2014). Temperature of the low salinity upper layer varies seasonally and typically ranges from 12-17°C, but can reach temperatures as low as 4°C in some areas during winter (Heath 1985; Henderson 2013b).

The fiords support highly endemic and diverse invertebrate and microalgae communities (Wing and Jack 2014). The inner fiords are characterized by an abundance of sessile invertebrate communities that include species of bivalves, tube worms, bryozoans, sponges, brachiopods, cnidarians and ascidians (Wing and Jack 2014). Closer to the fiord entrances, there is a dramatic transition to macroalgae communities and kelp forests (Wing and Jack 2014). The diversity of habitats across the depth and length of each fiord support many higher trophic level consumers, including deep water species like rattails (*Caelorinchus* spp.) and hagfish (*Eptatretus cirrhatus*),

rocky reef species like spotty (*Notolabrus celidotus*) and conger eel (*Conger verreauxi*), and pelagic fishes like mackerel (*Scomber australasicus* and *Trachurus declivis*). The most heavily fished species in Fiordland are blue cod (*Parapercis colias*), the red rock lobsters (*Jasus edwardsii*), and sea perch (*Helicolenus percoides*).

Fiordland is only sparsely populated by people but does support considerable tourism (hiking, scenic cruises, diving, etc.). In 1952, New Zealand established the Fiordland National Park, which covers an area of 1.26 million hectares. The national park is also recognized as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, Te Wāhipounamu. Bordering the national park are 10 marine reserves, ranging in size from 93 to 3,672 hectares. In total, the marine reserves cover more than 10,000 hectares of marine habitat within the inner fiords.

Life History and Reproduction

The bottlenose dolphin lifespan is 40–45 years for males and more than 50 years for females (Hohn *et al.*, 1989). Long-term observations of identifiable dolphins in Fiordland suggest some may be as old as 40 years (Boisseau 2003; Reynolds *et al.* 2004). Age at sexual maturity in bottlenose dolphins varies by population and ranges from 5–13 years for females and 9–14 years for males (Mead and Potter 1990). In a long-term study within Doubtful Sound, Henderson *et al.* (2014) calculated a mean age of 11.33 years (95% CI: 10.83–11.83) at first reproduction for three females of known age.

Single calves are born after a gestation period of about a year, but weaning and calving intervals vary among populations. Calves are nursed for a year or longer and remain closely associated with their mothers. On average, calving occurs every 3 to 6 years, and calves remain

associated with their mothers for roughly 3-6 years (Read *et al.* 1993). The calving interval of bottlenose dolphins in Doubtful Sound ranges from 1 to 10 years and is highly dependent upon calf survival (Henderson 2013b). For example, Henderson (2013b) found that when calves died within a month of birth, their mothers could produce another calf the following year; and, for mothers with calves surviving for longer than a year, the average inter-calving interval was 5.3 years.

In general, bottlenose dolphin length at birth is about 0.9 m to 1.2 m (Leatherwood *et al.*, 1983). To our knowledge, sizes of calves born in Fiordland have not been reported. Based on laser photogrammetry measurements of dorsal fin base length, Rowe *et al.* (2010) found that calves in Doubtful Sound (n=4) were smaller at first measurement than calves in Dusky Sound (n=11), suggesting they were either born later in the season or were smaller at birth.

While calving can occur throughout the year, seasonal peaks in calving occur in many populations, especially those in cooler, temperate regions (Urian *et al.* 1996; Henderson *et al.*, 2014). The bottlenose dolphins of Doubtful Sound show a strong birthing peak in warmer months of the austral summer (Boisseau 2003). In a 16-year study (1995-2011), Henderson *et al.* (2014) documented that calving in Doubtful Sound occurs from October – April but mainly takes place during December - February, when average water temperatures grow increasingly warmer. Calving in Dusky Sound appears to have a less pronounced seasonal peak and occurs from early December to May or June (Rowe *et al.* 2010).

Reproductive life is fairly long in bottlenose dolphins, and females as old as 48 years have been known to raise healthy calves (Boisseau 2003). Additional, specific life history information for bottlenose dolphins within Fiordland is lacking.

Diet and Foraging

Bottlenose dolphins are generalists and eat a wide variety of fishes and invertebrates that reflects both their preferences and the availability of prey (Corkeron *et al.* 1990). They are known to forage both individually and cooperatively and use multiple strategies to capture prey, such as passive listening, prey herding, and "fish whacking" using their flukes (Reynolds *et al.* 2000).

Stomach content analyses for Fiordland bottlenose dolphins are not available. However, a stable isotope analysis comparing isotope ratios in exfoliated skin tissue samples from dolphins (n=11) inside Doubtful Sound provides some indirect information on their diet (Lusseau and Wing 2006). This analysis suggests that, at least within Doubtful Sound, the dolphins' diet consists mainly of reef-associated fish (e.g., wrasses, perch, eel) and other demersal fish species (e.g., cod, sea perch; Lusseau and Wing 2006). Pelagic fishes, which enter the fiord from the adjacent Tasman Sea (e.g., mackerel and squid), and other deep basin species (e.g., hagfish and rattails) do not appear to comprise much of the dolphins' diet (Lusseau and Wing 2006). These results are consistent with observations of dolphins spending the majority of their time and diving mostly in areas associated with rocky reefs along the fiords' walls or sills in which demersal and reef-associated fish are most commonly found. In Milford Sound, tour operators have reported observing bottlenose dolphins feeding on yellow-eyed mullet, flounder, eels and trout (Lusseau and Slooten 2002).

For dolphins in Doubtful Sound, some observations suggest cooperative feeding through synchronous diving, and tour operators in Milford Sound have reported observing bottlenose dolphins cooperatively feeding on yellow-eyed mullet by herding and trapping them against the

wall of the fiord (Lusseau and Slooten 2002). However, individual diving and feeding appear to be more common (Boisseau 2003). Passive acoustic monitoring of dolphins within Doubtful Sound suggests that the dolphins forage more frequently at dawn and especially dusk (Elliott *et al.* 2011).

Mortality

Natural predators of bottlenose dolphins are mainly shark species, including bull, dusky, and tiger sharks (Shane *et al.* 1986). Bottlenose dolphins in Fiordland are observed with scars that may be from shark-attacks (Boisseau 2003), but predation rates have not been estimated. Anthropogenic sources of mortality appear to be limited and may predominately consist of boat strikes, which have been the focus of some conservation concerns (Lusseau 2005; Lusseau *et al.* 2006). The mortality rate for the dolphins in Doubtful Sound has been estimated at 8% per year, which is similar to rates measured for coastal populations in Florida (e.g., 7-9%; Boisseau 2003).

Behaviors

In general, the daily behaviors of bottlenose dolphins are categorized into several activities, such as travelling, socializing, foraging, milling, or resting. Activity budgets may depend on seasonal, ecological, and other factors (Reynolds *et al.* 2000). In Doubtful Sound, the group behavioral budget has been quantitatively divided into travelling, resting, milling, diving, and social behaviors (Boisseau 2003). About half of the dolphins' behavioral budget is spent on travelling, which in this case, is defined as movement in a uniform direction with short, regular dive intervals (Boisseau 2003). The dolphins' behaviors also appear to vary between the warmer, summer months and the colder, winter months. In the warmer summer months, the dolphins spend about 12 percent of their time milling and about 22 percent of their time socializing.

(“Milling” is defined as no net movement of the group, with individuals typically surfacing facing different directions. “Socializing” involves many aerial behaviors, physical contact, and the formation of small, tightly spaced clusters.) In winter, these activities accounted for only 4 percent (milling) and 11 percent (socializing) of the budget (Boisseau 2003). Presumably, the increase in social behaviors in the summer is associated with mating activities. In winter, diving also increases to about 22 percent of the budget (versus 16 percent in summer), possibly reflecting higher energy requirements in colder months (Boisseau 2003). In Milford Sound, the dolphins spend a greater proportion of their overall behavioral budget diving compared to the dolphins in Doubtful Sound (32 percent versus 22 percent; Boisseau, 2003). Socializing (15 percent) and resting (9 percent) are smaller portions of the overall budget for Milford Sound dolphins when compared to those in Doubtful Sound (20 percent and 13 percent, respectively). Boisseau (2013) hypothesized that the dolphins use Milford Sound primarily as a foraging ground.

In the wild, bottlenose dolphins may occur alone but are often observed in groups. Group sizes are highly variable and depend on a range of physical and biological factors such as physiography, prey availability, and behavioral state (Shane *et al.* 1982; Reynolds *et al.* 2000). In general, group size tends to increase with water depth or distance from shore (Shane *et al.* 1982; Reynolds *et al.* 2000). Coastal groups often contain about 2-15 dolphins, compared to offshore groups, which can contain about 25 to over a thousand dolphins (Reynolds *et al.* 2000; Scott and Chivers 1990; Leatherwood *et al.* 1983). Social structure within bottlenose dolphin populations is described as being a “fission-fusion” structure in which smaller groups form, but group membership is dynamic and can change on a fairly frequent basis (e.g., hours to days; Connor *et*

al. 2000). This fission-fusion society involves long-term, repeated associations between and among individual dolphins rather than constant associations; however, some long-term stable associations between individual dolphins are also observed and can last for years or decades (Reynolds *et al.* 2000).

Based on seven years of systematic surveys in Doubtful Sound (1995-2001), Lusseau *et al.*, 2003 reported an average group size of 17.2 dolphins (median = 14, n=1,292), with a skewed distribution towards smaller groups sizes (mode= 8). Most groups were of mixed sex, and the social structure appeared to consist of three main groups, each with a large proportion of strong and relatively stable relationships (Lusseau *et al.* 2003). In Dusky Sound, a median group size of 11.3 dolphins (quartiles: 25% = 6.0, 75% = 19.2; n=46) was reported by Lusseau and Slooten (2002) based on sightings network data from 1996 to 1999. For Milford Sound, Lusseau and Slooten (2002) reported that group size ranged from less than 5 to more than 40, with a median of 16.4 (quartiles: 25% = 9.0, 75% = 22.7; n=508). Group size in Milford Sound also varied across the length of the fiord, with larger groups more common at the entrance to the fiord, and smaller groups typically found within the fiord ($X^2 = 33.71$, df= 12, $p < 0.001$; Lusseau and Slooten 2002). Understanding of the social structure within the fiords to the north and south of Doubtful Sound is lacking (Boisseau 2003).

Abundance and Trends

Monitoring of the bottlenose dolphins within Doubtful Sound has been ongoing since 1990, and using data from standardized surveys conducted during 1990-1992, Williams *et al.* (1993) applied three different models to estimate a total population size of about 58 dolphins. Based on a survey completed in 2007, Currey *et al.* (2007) estimated a total population size of 56

dolphins (1.0% CV); and most recently, Henderson (2013a) estimated a population size of 61 dolphins (CV=1.5%) for 2012. Other than calves, no new dolphins have been sighted in this fiord since 2004; thus, immigration is probably rare (Currey *et al.* 2007; Henderson 2013a). Based on sightings data from 2007-2011, adult survival rates are very high (0.988, 95% CI: 0.956-0.997), and despite an increase since 2010, calf survival rates are quite low (0.622, 95% CI: 0.435 – 0.830; Henderson 2013a). Between 1995 and 2011, the average birth rate for dolphins in Doubtful Sound was 4.11 calves per year (SD = 2.49; Henderson 2013b). The majority of runs (62%) of an age-structured stochastic population model indicate this population is declining (Henderson 2013b).

Bottlenose dolphin surveys in Dusky Sound were initiated in 2007, and based on survey data from 2007-2008, Currey and Rowe (2008) estimated a resident population totaling 102 bottlenose dolphins (CV=0.9%). More recently, Henderson (2013a) completed a 4-year survey of Dusky Sound in 2012 and reported a population census of 124 dolphins, which closely matched the match-recapture estimate of 122 dolphins (CV = 0.83%). Henderson (2013a) also reported that no new adults or sub-adults have been identified in this fiord since 2009, suggesting that immigration may be rare. Adult survival rates in Dusky Sound are high (0.966, 95% CI: 0.944-0.98), but calf survival rates are quite low (0.722, 95% CI: 0.556-0.844, Henderson 2013a). The majority of runs (60%) of an age-structured stochastic population model indicate a negative population trend (Henderson 2013b).

The bottlenose dolphin abundance within Milford Sound has been estimated to be only about 45 to 55 total individuals (Lusseau *et al.* unpubl. data, as cited in Lusseau 2005). Boisseau (2003) also reported a provisional abundance estimate of 47 individuals (CV = 6.5%) for Milford

Sound. It is unclear how fully these estimates account for the other 6 fiords that this northern community of dolphins is known to use as part of its range. To our knowledge there are no other abundance estimates or trend information available for this population.

Based on the separate abundance estimates for Doubtful, Dusky, and Milford Sounds, the total abundance of bottlenose dolphins in Fiordland is probably close to 200 dolphins. Similarly, based on recent abundance estimates for Doubtful and Dusky Sounds and stochastic modeling for Milford Sound, Currey *et al.* (2009a) estimated a total population of 205 bottlenose dolphins in Fiordland (CV = 3.5%, 95% CI: 192–219). Using stochastic age-structured Leslie matrix population models, Currey *et al.* (2009a) also projected that the Fiordland population was highly likely to decline over the next one, three, and five generations.

Distinct Population Segment Analysis

The following sections provide our analysis of whether the petitioned entity - the bottlenose dolphins occurring within the waters of Fiordland, New Zealand - qualify as a DPS of *Tursiops truncatus*. To complete this analysis we relied on the best scientific and commercial data available, and we considered all literature and public comments submitted in response to our 90-day finding (79 FR 9880; February 21, 2014).

Discreteness

The Services' joint DPS Policy states that a population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:

(1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

(2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the ESA (61 FR 4722; February 7, 1996).

For purposes of this analysis, we defined the population segment of bottlenose dolphins of Fiordland to consist of the three communities that occur regularly in, or originate from, Milford Sound, Doubtful Sound and Dusky Sound. We use the term “community” here to mean a group of dolphins that share a common home range; whereas, we use the term “population” to apply more strictly to a closed reproductive unit. We considered the range of the possible Fiordland DPS to extend as far north as Jackson Bay. The more transient community of dolphins that occur in Milford Sound may range at least as far north as Jackson Bay, which is about 60 km north of Lake McKerrow at the northern edge of Fiordland (Figure 1; Russell *et al.* 2004, as cited in Tezanos-Pinto *et al.* 2010). Groups of bottlenose dolphins ranging in size from 2 to over 100 dolphins have been occasionally sighted as far south as Preservation Inlet but are of unknown origin (Currey 2008b). Lacking any basis to exclude the southernmost fiords, we considered the geographic range of the possible Fiordland population segment to extend as far south as Preservation Inlet. Dolphins that are only occasional visitors and not resident to Fiordland were not considered in our analysis as part of the potential distinct population segment.

There are no physical barriers preventing migration or movement of bottlenose dolphins out of Fiordland. Groups of dolphins from both Doubtful and Dusky Sound are known to have traveled outside their fiords (Henderson 2013a; Henderson *et al.* 2013), and are thus not restricted to a particular fiord. The bottlenose dolphins occurring in northern Fiordland are also

known to range over at least 7 fiords and possibly as far north as Jackson Bay, and they are considered to have a home range of at least 250 km (Boisseau 2003). Documented movements of other coastal populations of bottlenose dolphins in New Zealand indicate that the bottlenose dolphins elsewhere in New Zealand waters undertake long migrations. For example, a photo-identified bottlenose dolphin was sighted off of Westport only 66 days after having been sighted in Marlborough Sounds, indicating it had covered over 370 km in a maximum of 66 days (Figure 1; Brager and Schneider 1998). The bottlenose dolphins that occur in the Bay of Islands, which lies at the northernmost end of the North Island of New Zealand, are also known to travel to the Hauraki Gulf, over two hundred kilometers to the south (Berghan *et al.*, 2008), and their range, at minimum, extends 82 km north and 388 km south of the Bay of Islands (Constantine 2002).

Despite the long-range movements and lack of physical barriers, the closest bottlenose dolphin sightings north of Fiordland come from Westport, which is about 400 km north along the coast from Jackson Bay, and dolphins are only reported to occur there occasionally (Brager and Schneider 1998). Similarly, bottlenose dolphins have only been occasionally sighted in the southernmost fiords, to the south of Dusky Sound (Figure 1; Boisseau 2003; Henderson 2013a). Thus, there may be some degree of geographic separation of the Fiordland population as a consequence of existing distribution patterns.

A range of physiological, ecological, and behavioral factors can act as mechanisms to create or maintain separation among populations. In this particular case, we examined possible mechanisms, such as breeding cycles, diet, foraging strategies, and acoustic repertoires that could contribute to the marked separation of the Fiordland dolphins. As discussed previously, the breeding and birthing cycles of the Fiordland dolphins are seasonal, with births peaking in the

warmer months. This reproductive cycle, however, is likely to coincide or at least overlap with that of other New Zealand populations. For example, for the Bay of Islands population in the North Island of New Zealand, the majority of calves are born in the summer months (Constantine 2002). In fact, most global populations exhibit diffuse seasonality, with birthing peaks occurring in the warmer months (Urian *et al.* 1996). The varied diet and variety of foraging strategies that have been reported for dolphins in Fiordland suggest that these factors are also unlikely to create ecological barriers to mixing with other populations or communities. The acoustic repertoire of Fiordland dolphins is highly diverse and does include some vocalizations that may be unique to Fiordland (Boisseau 2005). However, many of the vocalizations are similar to those reported elsewhere (Boisseau 2005), and acoustic studies on other coastal New Zealand bottlenose dolphin populations appear to be lacking, thereby precluding comparisons. Other relevant data, such as social organization within and among communities of bottlenose dolphins of coastal New Zealand, also appear to be very limited and could not provide evidence of marked separation. After examining the best available information, we ultimately concluded there is insufficient evidence of particular physiological, ecological, or behavioral mechanisms contributing to the marked separation of the Fiordland dolphins from other bottlenose dolphin populations.

As highlighted in the DPS Policy, quantitative measures of morphological discontinuity or differentiation can serve as evidence of marked separation of populations. We examined whether the morphological data for bottlenose dolphins in Fiordland, which come from a limited number of dolphins from Doubtful Sound, provide evidence of marked separation of the Fiordland dolphins. As discussed previously, the asymptotic total length for adult bottlenose

dolphins in Doubtful Sound is predicted to reach at least 3.2 m, which is about 30 percent longer than adult bottlenose dolphins from the warmer-water populations in Texas and Florida (Perrin, 1984, Chong and Schneider 2001). Based on stereophotogrammetric measurements, fluke width and anterior flipper length also appear to be proportionately smaller for bottlenose dolphins in Doubtful Sound when compared to stranded bottlenose dolphins from Texas (Chong and Schneider 2001). The morphology of the Doubtful Sound dolphins is consistent with the general pattern of increasing body size with decreasing water temperatures and is similar to that of other deeper water populations and populations in higher latitudes (Ross and Cockcroft 1990; Hersh and Duffield 1990). Bottlenose dolphins elsewhere in New Zealand also exhibit longer body sizes, and as noted by Constantine (2002), the bottlenose dolphins in the Bay of Islands “appear to be morphologically the same as those in Marlborough Sounds and Doubtful Sound.” In the Bay of Islands, which lies along the northeast coast of the North Island, four corpses of presumed members of that region’s coastal population, had measured lengths of 2.84 m, 3.12 m, 3.13 m, and 3.16 m, comparable to the estimated length of Fiordland dolphins (Constantine 2002, citing unpublished data). Other data, such as skull measurements, which would allow for additional morphological comparisons, do not appear to be available for the Fiordland dolphins. Overall, we concluded there is no evidence of marked separation of the Fiordland population segment on the basis of a quantitative morphological discontinuity.

Photo-identification libraries, in which known individuals are catalogued based on dorsal fin markings, have been generated and maintained for many of the coastal populations of bottlenose dolphins in New Zealand, including Doubtful, Milford and more recently, Dusky Sound. These libraries allow tracking of the demographics and individual status of dolphins

within the dolphin communities. Over 17 years of photo-identification records have been amassed from surveys of Doubtful Sound and provide firm evidence that the dolphins of Doubtful Sound are fairly resident and have a high degree of natal philopatry (Henderson *et al.* 2013; Henderson *et al.* 2014). In surveys conducted from 2009 – 2012 in Dusky Sound, Henderson (2013a) also reported that no new adults or sub-adults were identified in the fiord after 2009, suggesting that immigration is limited or rare. While movements of dolphins outside of their main fiord have been documented, especially for Doubtful Sound, no permanent emigration has been reported, and the only new individuals identified in each community have been calves (Henderson 2013a). The lack of documented emigration or immigration in the datasets for both Doubtful and Dusky Sounds is a strong indicator that these communities are probably closed, and thus markedly separate from other coastal New Zealand or pelagic populations. Although there remains some uncertainty given the limited data for the community that frequents Milford Sound and for dolphins occurring in the southernmost fiords, we consider the survey data for Doubtful and Dusky Sounds, the two largest fiord systems in Fiordland, to be evidence of the demographic independence of the Fiordland population and thus marked separation of the Fiordland population segment from other bottlenose dolphin populations.

The hypothesis that the Fiordland dolphins are demographically independent is supported by genetic data that indicate restricted gene flow among New Zealand bottlenose dolphin populations. Analyses of mitochondrial DNA (mtDNA) control region sequences (n= 193) and 11 nuclear microsatellite loci (nuDNA, n=219) indicate that three discontinuous, coastal populations of bottlenose dolphins in New Zealand - the northeastern North Island, Marlborough Sounds, and Fiordland populations - are relatively genetically isolated from each other (overall

mtDNA $F_{st} = 0.15$, $p < 0.001$; overall nuDNA $F_{st} = 0.09$, $p < 0.001$; Tezanos-Pinto *et al.* 2008; Tezanos-Pinto *et al.* 2010). All pairwise comparisons of the three sample populations based on both mtDNA and nuDNA also indicate significant genetic differentiation ($p < 0.001$ for all F_{st} comparisons, Tezanos-Pinto *et al.* 2010). Within the Fiordland sample, which included samples collected from Jackson Bay ($n=5$) and Doubtful Sound ($n=14$), three dolphins shared an mtDNA haplotype with the North Island population and one dolphin shared a haplotype with the Marlborough Sounds population (Tezanos-Pinto *et al.* 2010). The remaining four haplotypes in the Fiordland sample were unique to the Fiordland dolphins (Tezanos-Pinto *et al.* 2010). Tezanos-Pinto *et al.* (2010) found no evidence of genetic sub-structuring within the combined Fiordland sample (i.e. Jackson Bay and Doubtful Sound); however, sample sizes were too small to allow rigorous statistical analysis. Tezanos-Pinto *et al.* (2008) also conducted a global assessment of genetic structure within *T. truncatus* by pooling the mtDNA samples for the three New Zealand populations and comparing that pooled sample to 13 other regional populations or subpopulations from the South Pacific, North Pacific and Atlantic Oceans ($n=579$). Overall, all sample populations were significantly differentiated ($F_{st}= 0.16$, $\Phi_{st} = 0.34$, $p < 0.0001$), and all pair-wise comparisons with the New Zealand sample population were also significant ($p < 0.0055$; Tezanos-Pinto *et al.* 2008); however, there were no phylogeographically distinct lineages at a regional scale. Tezanos-Pinto *et al.* (2010) also noted that the relatively large number of mtDNA haplotypes ($n=6$) and high levels of haplotype and nucleotide diversity for the Doubtful Sound sample ($h = 0.82 \pm 0.056$, nucleotide diversity = 1.54 percent ± 0.83) are inconsistent with expectations of genetic drift in a small isolated population (e.g., < 50 mature females). This diversity could reflect relatively recent isolation or periodic interbreeding with neighboring

communities or pelagic populations. We further note there are significant limitations of the currently available data due to the lack of genetic samples from the pelagic populations off New Zealand and from other communities within Fiordland. Thus, there is still considerable uncertainty regarding the degree of genetic isolation of the bottlenose dolphins within Fiordland, and further research is needed to more fully resolve the population structure.

Although the currently available genetic data do not support a conclusion that the Fiordland bottlenose dolphin population segment constitutes a completely separate population segment, the available genetic data do indicate varying magnitudes of differentiation of New Zealand dolphins from other global populations. Considering the available genetic data and the evidence of closed populations within Fiordland, we conclude that the weight of the evidence is sufficient to indicate that the Fiordland bottlenose dolphins are markedly separated from other populations of *T. truncatus*. Thus, after considering the best available data and information, we conclude that the Fiordland population segment of bottlenose dolphins is “discrete.” We therefore proceeded to evaluate the best available information with respect to the second criterion of the DPS Policy.

Significance

Under the DPS Policy, if a population segment is found to be discrete, then its biological and ecological significance to the taxon to which it belongs is evaluated. This consideration may include, but is not limited to: (1) persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that the loss of the discrete population segment would result in a significant gap in the range of a taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more

abundant elsewhere as an introduced population outside its historical range; and (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics (61 FR 4722, February 7, 1996). Significance of the discrete population segment is not necessarily determined by the existence of one of these classes of information standing alone. Accordingly, all relevant and available biological and ecological information for the discrete population segment is considered in evaluating the discrete population segment's importance to the taxon as a whole.

Persistence in an Ecological Setting Unusual or Unique for the Taxon

Bottlenose dolphins occur in a wide range of habitat types around the world. Within the range of the species, there is no typical or usual habitat type in terms of water depth, proximity to shore, water temperature, salinity, or prey resources. Provided there are sufficient prey resources, bottlenose dolphins can be successful in very diverse habitat conditions. For example, bottlenose dolphins occur in shallow, coastal bays, lagoons and estuaries; waters around oceanic islands; and in deep, offshore waters. They are found in warm, tropical waters as well as colder temperate waters, generally no farther than 45 degrees North or South (Leatherwood and Reeves 1983). The waters of Fiordland are an example of a colder, deeper water, coastal habitat at the southern limit of the species' range. Other and even more extreme occurrences of bottlenose dolphins have been recorded in relatively cold and/or deep-water habitats in the northern hemisphere, such as in Moray Firth, Scotland (57 degrees N; Cheney *et al.* 2013) and off the coast of Norway (Tomilin 1957, as cited in Kenney 1990) and southern Greenland (Leatherwood and Reeves 1982), and in the southern hemisphere, for example in the Patagonian and Fuegian channels and fiords (as far as 53 degrees S; Olavarria *et al.* 2010; Cheney *et al.* 2013). Thus, while Fiordland,

New Zealand is a biologically and geologically unique region towards the southern limit of the species' range, the persistence of bottlenose dolphins in this region is not in itself significant to the taxon as a whole.

The Petitioner asserted that Fiordland bottlenose dolphins have developed adaptations in response to their persistence in their cold-water habitat and that these differences qualify them as “significant” under the DPS Policy. Specifically, the Petitioner cites the larger body size as an adaptation stemming from their cold-water habitat and an indicator of the “significance” of the Fiordland dolphins. The Petitioner also discusses the dolphins’ “unusual” seasonal distribution patterns, larger group sizes, and distinct social structure. Thus, we considered possible adaptations to the particular ecological setting and whether they indicate that the bottlenose dolphins in Fiordland are “significant” to the taxon as a whole.

As discussed previously, the morphology of the Fiordland bottlenose dolphins appears to be consistent with the general pattern of increasing body size with decreasing water temperatures, similar to that of other deep water populations and populations in higher latitudes (Hersh and Duffield 1990; Ross and Cockcroft 1990; Constantine 2002). For example, bottlenose dolphins found in Tierra del Fuego, South America, reach lengths over three meters, and eastern North Atlantic dolphins, like those in Moray Firth, Scotland, measure as long as 3.8 m (Perrin and Reilly 1984; Goodall *et al.* 2011). Even larger body lengths of up to 4.1 m have been recorded for bottlenose dolphins in the northeastern Atlantic (Connor *et al.* 2000, citing Frazer 1974 and Lockyer 1985). It has been hypothesized that a larger body size provides a thermal advantage in colder water by reducing the surface-area-to-volume ratio (Ross and Cockcroft 1990). In colder waters, the proportionally smaller appendages may also help

minimize heat loss by decreasing the surface area-to-volume ratio (Boisseau 2003; Ross and Cockcroft 1990). Likewise, smaller body sizes and proportionally larger flippers in warmer waters may in part be a consequence of the greater requirement for heat dissipation (Hersh and Duffield 1990). This pattern of increased body size and smaller appendages is common in both terrestrial and marine species found across a wide range of latitudes, and is thus not unique to bottlenose dolphins (Boisseau 2003; Reynolds *et al.* 2000). In summary, the Fiordland population's morphological characteristics are neither unexpected given its habitat nor unobserved in other bottlenose dolphin populations. This information strongly suggests that larger body size is not a unique adaptation to Fiordland but is part of the observed variability for the taxon; therefore, we conclude this characteristic does not qualify this population segment as significant to the taxon as a whole.

In general, group sizes observed for the Fiordland bottlenose dolphin communities are considered relatively large. As discussed earlier, group sizes vary among the three Fiordland communities, and the reported medians from a study of all three communities were 11.3 (n=46), 16.4 (n=508), and 21.2 (n=568) for Dusky, Milford, and Doubtful Sound, respectively (Lusseau and Slooten 2002). In Milford Sound, group size also varied significantly depending on location within the fiord, with larger groups being more common near the entrance to the fiord (Lusseau and Slooten 2002). Based on observations of 1,292 groups followed in Doubtful Sound from 1995 to 2001, Lusseau *et al.* (2003), found that group sizes ranged from less than 5 to over 55 dolphins and averaged 17.2 dolphins (median = 14).

Although large compared to many coastal, resident populations, the reported group sizes for the Fiordland dolphins is not dissimilar from group sizes reported for other coastal

populations in New Zealand. For example, group size for bottlenose dolphins in the Bay of Islands was found to range from an average of 18.1 dolphins in Spring (median = 20, range = 2-50, n=31) down to a low of 13.8 in Winter (median = 12, range = 2-40, n=50, Constantine 2002). Dwyer *et al.* (2013) reported a high level of year-round use of the waters off the west coast of Great Barrier Island, which lies at the outer edge of Hauraki Gulf, North Island, by “large groups” with a median size of 35 (other statistics were not available). Lastly, in the Marlborough Sounds, South Island, group size was found to range from 3-172 dolphins, with a median size of 12 (n=45, SD = 38), and with most groups (n=34) containing more than 11 dolphins (Merriman *et al.* 2009).

Group size for Fiordland dolphins is also similar to, or even smaller than, group sizes reported for bottlenose dolphins occurring in the comparably cold and deep water habitats of Patagonia. Based on 32 separate sightings recorded during 2001-2010 in the Patagonian fiords of southern Chile, Olavarria *et al.* (2010) reported that group size ranged from 2 – 100 and averaged 25 dolphins. Similarly, in eight sightings of bottlenose dolphin groups over the course of 14 surveys during 2000-2001 in the northern Patagonia fiords of southern Chile, Viddi *et al.* (2010) reported group sizes of 4-100 dolphins and an average group size of 34. In addition, when compared to other bottlenose populations generally, the group sizes reported for Fiordland are well within the observed variability. For example, Scott and Chivers (1990) reported fairly large mean and median group sizes of 94 and 12, respectively, for coastal bottlenose dolphins in the eastern tropical Pacific Ocean (n=867); and Zaeschmar *et al.* (2013) reported groups sizes ranging from 2-250 dolphins and averaging 62.8 dolphins in waters off the northeastern coast of the North Island, New Zealand (n=36, SD=42.8).

Group size may be affected by factors such as presence of predators, prey availability, habitat complexity, season, and activity type (e.g., foraging, breeding; Shane *et al.* 1986; Heithous and Dill 2002; Gowans *et al.* 2008). Whether and how these and other ecological factors influence group size has received inconsistent support in the literature, complicating researchers' ability to establish general, consistent relationships between group size and ecological factors (Scott and Chivers 1990; Corkeron 1997; Gygax 2002; Gowans 2008). It remains unclear the extent to which variation in group size across the species is a result of random historical processes versus selective pressures (Gygax 2002). Perhaps lesser but additional complications hampering interpretations of group size are the differing perceptions of what constitutes a group, and inconsistencies among studies in terms of the criteria used to define "a group" (Shane *et al.* 1986; Connor *et al.* 2000).

Overall, given the natural variability of group size observed in bottlenose dolphins, the similarity of group sizes within Fiordland to those reported elsewhere, and the lack of a clear understanding of the drivers of this variation, we find there is insufficient evidence that the group sizes reported for Fiordland communities reflect a special or unique adaptation to their habitat such that it qualifies the population segment as "significant" to the taxon as a whole.

A characteristic related to group size is social structure, and as discussed earlier, bottlenose dolphins are highly social animals exhibiting a "fission-fusion" social structure (Connor *et al.* 2000). The "fission-fusion" social structures of bottlenose dolphins is highly plastic and ranges dramatically among communities or populations from being characterized by a high proportion of long-lasting associations (Lusseau *et al.* 2003) to consisting mostly of short-term (several days) associations (e.g., Lusseau *et al.* 2006). Complexity of the overall social

structure also varies widely and can include few or many levels of organization and alliances. Influences that contribute to inter- and intra-population variation in social structure may include availability of prey, disturbance, dispersal, and other demographic factors (Ansmann *et al.* 2012; Augusto *et al.* 2012; Morteo *et al.* 2014; Hamilton *et al.* 2014). Also, while social structure for a particular community or population can remain stable over multiple generations, it is not necessarily a fixed or rigid characteristic for a particular population or geography and can change in response to changing conditions, such as changes in fishing practices (Ansmann *et al.* 2012).

Doubtful Sound bottlenose dolphins appear to have a relatively unique social structure that includes a large proportion of strong, long-lasting associations both within and between sexes (Lusseau *et al.* 2003). The community structure also seems more stable over time compared to other populations (Lusseau *et al.* 2003). However, group membership was still fluid and thus consistent with a “fission-fusion” model; and, females did display an association pattern similar to that of populations elsewhere (Lusseau *et al.* 2003). Lusseau *et al.* 2003 concluded that the most parsimonious explanation of the observed social structure is the isolation of the Doubtful Sound community from other bottlenose communities. According to this hypothesis, the geographic isolation and consequent lack of immigration and emigration, promotes the formation of alliances and stability of the overall social structure. Lusseau *et al.* (2003) also hypothesized the stable social structure observed in Doubtful Sound could be driven by the temporally and spatially variable prey resources within the fiord and a requirement for greater cooperation among the dolphins in order to forage efficiently. Data to test either of these hypotheses are not available. Thus, it is not possible to determine whether the observed social structure in Doubtful Sound is a special or unique adaptation in response to ecological

constraints, or whether it is simply a consequence of the community's relative isolation.

To our knowledge, the only study of social structure for bottlenose dolphins within Fiordland comes from the Doubtful Sound community, and comparable studies for the remaining fiords appear to be lacking. The extent to which the social structure of Doubtful Sound can be extrapolated to the other communities is unknown, especially for the transient community that occurs in the northern fiords (Boisseau 2003). Given the unknown social structure of the other Fiordland communities and the uncertainty of whether the observed social structure in Doubtful Sound is evolutionarily meaningful, we conclude this interesting characteristic of the Doubtful Sound community does not qualify the Fiordland population segment as “significant” to the taxon as a whole.

The Petitioner discusses the seasonal changes in distribution of the Fiordland dolphins in response to water temperature and asserts this is relatively unusual behavior. The Petitioner discusses how the Fiordland dolphins tend to occupy the warmer waters of the inner fiords during the summer calving season; and in winter, when the inner fiord waters become colder, the dolphins are found closer to the fiord entrances. This seasonal change in habitat use has been documented for the dolphin community in Doubtful Sound (Elliott *et al.* 2011; Henderson 2013b); however, as discussed in detail previously, it is not necessarily the case for the other Fiordland communities (Lusseau 2005b, Currey *et al.* 2008c, Henderson 2013b). Furthermore, seasonal habitat shifts that are correlated with water temperature are not uncommon among coastal bottlenose dolphin populations, especially those at higher latitudes (Shane *et al.* 1986; Wilson *et al.* 1997). Populations at lower-latitudes also show local seasonal changes in distribution, which may be in response to factors other than water temperature (Shane *et al.*

1986). Populations in the western Atlantic also undergo seasonal migrations that correspond to changes in water temperature (Connor *et al.* 2000). Similar to the females in Doubtful Sound, female dolphins elsewhere have also been observed to make use of more warmer and more protected areas for calving (Shane *et al.* 1986; Wilson *et al.* 1997). Overall, we conclude that this particular behavior does not help qualify the Fiordland population segment as “significant” to the taxon as a whole.

In summary, while the Fiordland bottlenose dolphins do exhibit differences from bottlenose dolphin populations in other regions and habitat types, given the tremendous intraspecific diversity of physical and ecological characteristics of bottlenose dolphins and the noted inconsistencies and limited information for the Fiordland population segment, these differences do not set the Fiordland bottlenose dolphins apart from the remainder of the taxon. Common bottlenose dolphins are highly adaptable and successfully occupy and persist in a diverse range of habitat types, including other cold and deep water habitats in both hemispheres. The available information leads us to conclude that the particular variations observed for some or all of the Fiordland bottlenose communities do not make this population segment more ecologically or biologically important relative to other individual populations or communities. Therefore, we conclude that persistence of bottlenose dolphins in Fiordland is not “significant,” to the taxon as a whole.

Significant Gap in the Range of the Taxon

The second consideration under the DPS Policy in determining whether a population may be “significant” to its taxon is whether the “loss of the discrete population segment would result in a significant gap in the range of a taxon” (61 FR 4722, February 7, 1996). Bottlenose

dolphins are distributed worldwide from tropical to cold temperate waters. The bottlenose dolphins within Fiordland constitute a very small fraction of the global abundance and occupy a very small fraction of the global range of this species. The roughly 200 dolphins occupying the fiords along about 200 km of New Zealand's South Island represent such a numerically and geographically small portion of the taxon that the hypothetical loss of the dolphins in this region would not constitute a significant gap in the range of the species. Furthermore, groups of dolphins from populations of unknown origin have been sighted in the waters of Fiordland south of Dusky Sound (Boisseau 2003). There are no reported matches of these dolphins to photo-identified dolphins of Dusky Sound or any other fiord (Henderson 2013a). Thus, it is possible that dolphins from another population use portions of Fiordland occasionally and could eventually recolonize a gap left by the loss of the Fiordland dolphins. There is also no evidence to suggest that the loss of the Fiordland bottlenose dolphins would inhibit population movement or gene flow among other populations of the species. Overall, we conclude that loss of the Fiordland bottlenose dolphins would not result in a significant gap in the range of the taxon.

Only Natural Occurrence of the Taxon

Under the DPS Policy, a discrete population segment that represents the “only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range” can be evidence indicating that the particular population segment is significant to the taxon as whole (61 FR 4722, February 7, 1996). This consideration is not relevant in this particular case, because *T. truncatus* is widely distributed throughout its historical range.

Genetic Characteristics

As stated in the DPS Policy, in assessing the significance of a discrete population, we consider whether the discrete population segment differs markedly from other populations of the species in its genetic characteristics (61 FR 4722, February 7, 1996). Therefore, we examined the available data to determine whether there was a reasonable indication that the Fiordland bottlenose dolphins differ markedly in their genetic characteristics when compared to other populations. In conducting this evaluation, we looked beyond whether the genetic data allow for discrimination among populations or communities, and instead we focused on whether the data indicate marked genetic differences that appear to be significant to the taxon as a whole. In this sense, we give independent meaning to the “genetic discontinuity” of the discreteness criterion of the DPS Policy and the “markedly differing genetic characteristics” of the significance criterion. Following our approach in the ESA status review for false killer whales (*Pseudorca crassidens*; Oleson *et al.* 2010), we consider that the strength of evidence for the genetic consideration of “significance” should be greater than that for “discreteness,” and we interpret “markedly” in this context to mean that the degree of genetic differentiation is consistent with a population that could have genetic adaptations to the local habitat.

As discussed earlier, analyses of both maternally derived mtDNA and 11 nuclear microsatellite loci indicate significant levels of differentiation among Fiordland, Marlborough Sounds and North Island bottlenose dolphin sample populations (Tezanos-Pinto *et al.* 2010). Pairwise comparisons of the Fiordland sample (n=18) to the other New Zealand samples (n=100, North Island; n= 31, Marlborough Sounds) based on the 11 microsatellite loci, had statistically significant but fairly low F_{st} values (0.056 and 0.139, respectively; $p < 0.001$), indicating shallow levels of differentiation, especially between Fiordland and the North Island

(Tezanos-Pinto *et al.* 2010). Pairwise comparisons of the sample populations for mtDNA control region sequences also gave significant F_{st} values (0.12 and 0.20, $p < 0.001$, Tezanos-Pinto *et al.* 2010) of a relatively low magnitude when compared to an expected value for populations experiencing one migrant per generation (i.e., an F_{st} value of roughly 0.33 for mtDNA), indicating a lower level of genetic differentiation and thus greater gene flow than would be expected if there was one migrant per generation. (As a general rule of thumb, geneticists consider gene flow rates below one effective migrant per generation as the level at which local adaptation is likely.) Based on the mtDNA data, Tezanos-Pinto *et al.* (2008) estimated migration rates per generation of 4.89 females (CI = 0.02 – 20.32) from the North Island to Fiordland and 0.31 females from Marlborough Sounds to Fiordland (CI = 0.00 – 3.12), which is consistent with the finding of a lower degree of divergence between the North Island and the Fiordland dolphins and the possibility of more than one migrant per generation.

In addition, and as noted earlier, the genetic samples for the Fiordland dolphins had high levels of haplotype and nucleotide diversity ($h = 0.82 \pm 0.056$, nucleotide diversity = 1.54 percent ± 0.83), which Tezanos-Pinto *et al.* (2010) hypothesized could reflect relatively recent isolation or periodic interbreeding with neighboring communities or pelagic populations. This high level of genetic diversity also contrasts with the low levels of genetic diversity reported by Natoli *et al.* (2004) for coastal bottlenose dolphin populations sampled from various geographic regions.

As discussed previously, Tezanos-Pinto *et al.* (2008) also conducted a global assessment of genetic structure within *T. truncatus* by pooling the mtDNA samples for the three New Zealand populations and comparing that pooled sample to 13 other regional populations from the

South Pacific, North Pacific and Atlantic Oceans (n=579). All populations were significantly differentiated ($F_{st}= 0.16$, $\Phi_{st} = 0.34$, $p < 0.0001$); however, there were no phylogeographically distinct lineages at a regional scale (Tezanos-Pinto *et al.* 2008). Overall, this assessment suggests that the coastal and pelagic populations sampled are interconnected on an evolutionary time scale through long-distance dispersal (Tezanos-Pinto *et al.* 2008).

In summary, the Fiordland bottlenose dolphins display a relatively high level of genetic diversity, relatively low magnitudes of genetic differentiation, and may experience gene flow at rates above the level likely to lead to local adaptation. Mechanisms for the observed genetic diversity are unknown and may be the result of interbreeding with other populations or insufficient time for drift or local adaptation to occur. The extremely limited genetic data for the Milford Sound community and lack of genetic data for the Dusky Sound community add to the level of uncertainty regarding the evolutionary significance of genetic characteristics of the Fiordland population segment. Taken together, there is insufficient data to show that the genetic characteristics of the Fiordland bottlenose dolphins differ markedly from other populations of the species.

DPS Conclusion and ESA Finding

According to our analysis, the Fiordland bottlenose dolphin population is discrete based on evidence it is a relatively closed and isolated population segment. However, while discrete, the Fiordland dolphin population segment does not meet any criteria for significance to the taxon as a whole. As such, based on the best available data, we conclude that the Fiordland bottlenose dolphins do not constitute a DPS and thus do not qualify for listing under the ESA. Therefore, we do not propose to list this population segment. As this is a final action, we do not solicit

comments on it.

References

A complete list of the references used in this proposed rule is available upon request (see **ADDRESSES**).

Authority: The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: June 11, 2015.

Samuel D. Rauch, III.

Deputy Assistant Administrator for Regulatory Programs,
National Marine Fisheries Service.

[FR Doc. 2015-15087 Filed: 6/18/2015 08:45 am; Publication Date: 6/19/2015]